

**A horizontal microscope** (with plate VI).—The laboratory for plant physiology can hardly be considered adequately equipped which does not possess a microscope adapted to measuring directly the vertical growth of plants. The auxanometer, in simple or complex form, is scarcely more indispensable. If no specially constructed instrument is available some makeshift must be devised to enable direct observation of growth. After utilizing common microscopes in various degrees of disorganization, but with unvarying dissatisfaction, the instrument illustrated by *plate VI* was devised by the writer, in consultation with Dr. Rodney H. True, to facilitate whose researches it was immediately needed.

It will be observed at a glance that the general idea of the instrument is that illustrated in Pfeffer's *Physiologie* 2:85, *fig. 8*, which is essentially the form still used in the Leipzig laboratory. Upon comparison, however, it will be readily seen that the instrument here described has a number of points of superiority in the accuracy, readiness, and range of adjustment. It was constructed from my drawings by the Bausch & Lomb Optical Co., of Rochester, N. Y., to whose courtesy I owe the illustration.

The base is the large lead-filled brass tripod of their "Investigator" stand, with leveling screws. This base is the only part which I now think could be improved. It would be better were it somewhat larger and heavier. Its radial spread is now 10<sup>cm</sup>; it might well be 12<sup>cm</sup> with correspondingly increased weight. From the base rises a tube 3<sup>cm</sup> in external diameter, sawed at the top, where it is pinched by a screw collar. Within the outer tube slides a nickel draw-tube, 22<sup>cm</sup> long, which can be set at any height, up to its maximum, by means of the screw collar. The upper end of the draw-tube carries a pinion, with double milled heads, engaging a rack on a triangular slide. By means of this rack and pinion the body, which has been roughly brought to the required height by means of the draw-tube, can be accurately set. A finer adjustment has not been found necessary, since a 1<sup>in</sup> objective has given the highest power required, and with this the micrometer lines can be made to coincide accurately with the tip of the object under observation.

At right angles to the triangular slide is fixed a tube in which moves the nicked body, actuated by a pinion which engages a rack on the body. This adjustment serves to focus the instrument. Above the pinion, between its milled heads, is fastened a spirit-level, accu-

rately parallel with the body, so that by means of the leveling screws it can be made horizontal.

The optical parts consist of a 2<sup>in</sup> eyepiece, 1<sup>in</sup> and 3<sup>in</sup> objectives. Fixed in the focus of the eye lens of the ocular is a micrometer divided into tenths of a millimeter.

The method of using the instrument is so obvious that it needs no special explanation.—CHARLES R. BARNES, *University of Wisconsin, Madison.*